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THE HAWAIIAN

# FORESTER & AGRICULTURIST

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## *BULLETIN ON FERTILIZERS.*

Detailed suggestions on the best methods of fertilizing and the most profitable kinds of fertilizer constituents to apply on soils of different character, to cotton, corn, oats, wheat and cowpeas, are contained in Farmers' Bulletin No. 398 (Farm Practice in the Use of Commercial Fertilizers in the South Atlantic States), recently issued by the U. S. Department of Agriculture, and obtainable by application to the Secretary or to any Senator, Representative or Delegate in Congress.

Commercial fertilizers are expensive, and should be used only when needed, and then the deficiencies and requirements of the soil and of the crop must be a matter of accurate knowledge before they can be used with economical benefit. The character of the soil has a marked influence on the quantity and kind of fertilizer it is necessary to use in a good system of farming. And because a fertilizer is strikingly effective on one crop, upon a certain kind of soil, is not proof that the same combination will be at all beneficial to that crop on another kind of soil, and certainly not that its use with a different crop, upon another soil, will be economical. Yet the study of the author shows that this is too common a practice among a certain class of farmers. The formula suited to cotton on a red clay soil may need serious modifications for crops on sandy, sandy loam and gray loam soils, and for all crops other than cotton on red clay soil. Some farmers get twice as large yields as others, both located on similar soils, due to the fact that the former have a better understanding of the use of fertilizers and employ better farm methods.

The importance of taking into consideration all the factors which influence the use of fertilizers can not be too strongly emphasized. To properly adjust the required ingredients, the farmer must study his own farm conditions. No definite quantity or proportion of fertilizer constituents can ever be given that will meet the needs of a crop under all circumstances, as the rotation of crops, the growing of legumes, the use of crops for green manuring, the application of barnyard manure, the methods of prepara-

tion and cultivation, and the character of the soil will always be factors which must be taken into consideration when using commercial fertilizers.

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A report of the Ceylon Agricultural Society in the Tropical Agriculturist (Colombo) for May says: "Some seed of the Algaroba or Mesquit bean (*Prosopis juliflora*) has been rceeived from the Hawaiian Islands, but it is doubtful whether any will germinate, as they have been badly attacked by insects. The seeds were got out at the instance of a member, who thinks that the tree might be introduced into our dry areas and meet the difficulty of securing a supply of cattle fodder during the rainless months of the year."

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Rudolph D. Anstead, a planting expert, writes as follows on information that dragon flies had been doing damage by eating the young tips of Hevea rubber tree shoots: "That dragon flies eat any part of a plant is an entirely erroneous idea. Their food consists of the small insects of which there are so many always flying about, and this is what they are after when they are seen hawking about all day. They occasionally settle on a twig for a rest, but when in this position are not feeding. That the Hevea shoots in question had been damaged is undeniable, but the damage was done probably by some form of aphis or blight, though this could not be found, and it is more than probable that the dragon flies were feeding on the blight. The larvae of the dragon fly are grub-like insects with large heads and formidable jaws, and are found in ponds and streams. These grubs feed voraciously on small water insects."

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A historical and industrial number of the Mindanao Herald has been received. It makes a beautifully printed magazine of nearly a hundred pages three columns wide, "commemorating a decennium of American occupation of the land of the Farthest East and Nearest West." The number is on book paper and copiously illustrated in half tones. It gives a splendid insight of the prodigious resources of the Philippines and of their rapidly advancing development under American rule.

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An agricultural school for pagan children is being established in the district of Davao, Island of Mindanao, Philippine Islands. C. R. Cameron, provincial superintendent of schools, has been working on the plan for some time. The school will be organized along military lines, the pupils to be uniformed and arranged in companies and squads, and the various activities timed to reveille, mess call, retreat, taps, etc. The purpose of the school

will be to teach its pupils practical agriculture as it is carried on in the Gulf of Davao, together with English, reading, writing and arithmetic, also the incidental trades such as carpentry, blacksmithing, etc., which experience has proved to be necessary for the successful operation of a plantation. Governor Pershing, on a recent visit to the district, the Mindanao Herald says, "investigated the project and is of the opinion that such a school will be a great civilizing influence among the wild people, and of much assistance to planters throughout the district."

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Many applications for land have been received by the public lands board appointed under the amendments of the Organic Act made at last session of Congress. Land settlement will be the most commanding subject of government activity for some time to come, and the new policy is bound within a few years to make a great increase in diversified agricultural products.

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## *FARMERS IGNORANT OF LOSS.*

Ask any farmer how much each dollar he has received in returns cost him to produce. Ask him whether the expenditure of one dollar in capital and labor returned him $1.10 or 90 cents.

He can't answer. The debit side of the ledger is void so far as he is concerned, and the part played in the production of an acre of corn by such items as rent of land, interest and depreciation of machinery, man labor and horse labor, has never entered into his calculation. If he should sit down and figure out his business in all the minutiae of detail that is necessary for the proper conduct of other business undertakings, mercantile or manufacturing, he might find that he was actually producing crops at a loss. A large percentage of American farmers, probably the majority of them, actually are producing foodstuffs at a loss, on the basis of the science of modern business.

Calculating on the basis of the original value of his land, the farmer is making money. Calculated on the current market price at which he could withdraw his investment and put it in interest-bearing industrial securities, he is losing money every time the seasons revolve. In many sections of the country farm values have doubled, even trebled in the last generation. Land that has been worked on the basis calculation of from $5 to $20 an acre must in the future respond to acreage values of from $75 to $200. The old generation with its obsolete methods, which has persisted solely on the excuse of cheap land, must give way before the new generation. The new-comer, the man who would establish himself as a farmer today, has to meet the changed conditions, and it is to these conditions that the business of farming must respond.

The question of fixed capital has come to stay. We are not yet out of our first generations as farmers on a grand scale. The first generation is taking its hand from the plow, and those who follow the pioneers, either through deed or sale or probate, must hereafter reckon interest on investments as an actual item of cost. Farming as an industry is in its transitional stage, and it is to meet the new conditions in a businesslike way that experts have been giving their attention to the question of devising a system of cost accounting for the farmer.—*The Bookkeeper.*

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## *ROSELLA VS. CRANBERRY.*

At the experimental gardens at Fort Brown experiments have been carried on with the rosella plant, which have proved a great success. The rosella plant promises to become a great rival of the cranberry. The plant was first introduced into Texas about two years ago from Jamaica by the Agricultural Department of the United States government, and since that time has proved very adaptable to the lower Rio Grande valley soil and climate. In the matter of taste the sauce of the rosella can hardly be told from the cranberry, and in some localities in south Texas many truck growers have supplied the local merchants who have been selling it in place of cranberries with practically the same degree of satisfaction to the trade. The rosella possesses the attractive trade advantage, however, of being two colors, red and white, and alongside of it may be growing a bush bearing red fruit. The product of the rosella plant is really not a fruit; it is the fleshy, acid cycles of the flowers that are used for making sauces, jellies and refreshing drinks.

It has been amply demonstrated at the gardens that these plants are easily grown here, and are well adapted to the soil and climate of the valley, and it is predicted by many that within a very few years it will be an extensive and profitable lower Rio Grande valley product. The average yield of the plant is twenty quarts to the plant, with an average price of five cents per quart. The rosella plant in some instances grows to a height of seven feet, and 800 to 1,000 of the plants can be grown on an acre, which requires considerably less cultivation and attention than many of the valley products.

In the experimental gardens at Fort Brown the seeds of the rosella plant were sown last June, and the harvesting of the fruit began in November.

On account of the climatic conditions of the valley, the rosella plant is more profitable there than in any other section of the state. The plant will bear from one to two months longer on account of absence of frost until late in the winter.—San Antonio Express.

## *BOARD OF AGRICULTURE AND FORESTRY.*

A meeting of the Board of Commissioners of Agriculture and Forestry was held in the Board room, at the Capitol, on Wednesday, May 25, 1910, at 2 p. m.

*Present*—Marston Campbell, President and Executive Officer; Messrs. J. M. Dowsett and Albert Waterhouse, members; R. S. Hosmer, Superintendent of Forestry, and Dr. V. A. Nörgaard, Territorial Veterinarian, by request.

### FORESTRY.

President Campbell read communication of May 4, 1910, from T. Clive Davies, trustee for the fund, in which certain conditions are set forth subject to the disposal of the Kohala Forest Reserve contribution of $24,280; also reply to same of May 19, stating that these conditions are entirely satisfactory and that this now places the matter where the Superintendent of Public Works may enter condemnation proceedings.

Mr. Dowsett stated that in regard to the construction of the storm ditches and reservoirs on this land, he understood the rights to the water were not entirely in the possession of the Woods Estate, the Woods Estate having leased to the Wight Estate the pastoral rights, the right to run their cattle there, which carry the right to water their stock. It is a very good thing to have the ditch go there for ranch purposes.

Mr. Campbell said he thought of making these people a tentative offer of $7.50 an acre, which they will probably reject, and we can then come to a compromise. He is satisfied that not more than $10 per acre need ever be paid for these lands.

Mr. Dowsett's suggestion was that we offer these people $10 per acre less 25 per cent., and instruct Mr. Campbell to submit the matter to the trustees for the fund for their consideration of such a deduction. After Mr. Davies has been made fully familiar with the facts in the case he cannot object.

It was voted that the Superintendent of Public Works be instructed to secure all necessary information and that same be communicated to the trustees and that the Superintendent be further requested to take the required steps for the securing of these lands either by cash payment, compromise or condemnation proceedings.

The Superintendent of Forestry was instructed to secure description of the lands of Kehena III from the Territorial Survey Office, also transcript from the Registrar of Deeds.

Mr. Hosmer pointed out on the map where the present fences were and recommended that forest planting be started on a portion of the land of Puukapu, on a portion of the Waimea village. He said that Mr. A. W. Carter, on behalf of the Parker Ranch, had agreed to contribute an equal amount for forest planting on

this area, not to exceed, however, $5,000, and if the Territory would put up $5,000 there would be altogether $10,000 to be expended for this purpose.

A discussion followed as to the details of this arrangement, it finally resulting in the request to the Superintendent of Forestry to take this matter up with Mr. Carter and report back to the Executive Officer.

It was then voted that the Board authorize the expenditure from the money set aside for the fencing and tree planting on the Kohala Mountain a sum not to exceed $5,000 for tree planting above Waimea village, on condition that the Parker Ranch expend an equal amount in coöperation.

Mr. Hosmer submitted the manuscript of Mr. Louis Margolin's report together with a letter recommending its publication as a bulletin. No action was taken.

ANIMAL INDUSTRY.

It was voted that a salary of $50 per month, beginning May 1, 1910, be alloted Dr. John C. Fitzgerald, the Deputy Territorial Veterinarian for the District of Maui.

MILK ORDINANCE.

The Board considered the Milk Ordinance and directed the Territorial Veterinarian to continue his work in the investigation of the prevalence of tuberculosis among the dairy cattle of Honolulu and vicinity with a view to obtaining data upon which to base regulations.

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A meeting of the Board of Commissioners of Agriculture and Forestry was held in the Board room, at the Capitol, on Tuesday, June 7, 1910, at 2 p. m.

*Present*—Marston Campbell, President and Executive Officer; Messrs. J. M. Dowsett and Albert Waterhouse, members; Alexander Lindsay, Jr., Attorney General of Hawaii; Dr. V. A. Nörgaard, Territorial Veterinarian, and Dr. R. Glaisyer, until recently a veterinary inspector of the U. S. Bureau of Animal Industry.

ANIMAL INDUSTRY.

A discussion followed regarding the Territorial Veterinarian's work of investigating the prevalence of tuberculosis among the dairy cattle in the Territory. Attorney General Lindsay stated the County had passed an ordinance that all cows must be kept clean; that the Board of Health had power to have removed all filth and sources of sickness, and that the Board of Agriculture and Forestry had the power to condemn and to destroy cattle, when in the opinion of the Territorial Veterinarian there is dan-

ger of the disease spreading and the health of other cattle being endangered.

Mr. Waterhouse stated that we must come to some decision with regard to the disposal of the cows which have reacted to the tuberculin test.

Dr. Nörgaard said that Mr. Isenberg had the largest herd in town and that only twenty-eight per cent. of them had passed the test, and that, as a member of the Board, the action taken in his case will be a precedent for others to follow.

Mr. Waterhouse said the Board should require Mr. Isenberg to segregate his cows.

Mr. Campbell said that when Mr. Isenberg is made to understand the gravity of the situation he is sure the matter will go through, in the meantime the animals might be kept in quarantine.

Mr. Waterhouse said he thought a practical proposition was to make a more or less elastic ordinance which will cover, when necessary, all problematical situations, or those of a questionable character.

BRANDING OF COWS.

Mr. Campbell said that we must decide upon some method for the identification of clean cows.

Attorney General Lindsay stated that by the statutes the Board of Agriculture and Forestry has the right to make rules and regulations, which, of course, require the approval of the Governor.

Mr. Waterhouse said the latest idea of marking reacters was suggested by the Washington Department of Agriculture and that is the use of an official aluminum ear-tag on those that are clean. He expressed the belief that the Board would do well to send for a series of these tags.

Mr. Campbell said he thought there would be no difficulty in securing these tags, as Territorial Veterinarian Nörgaard is a United States employee, representing them in the Territory of Hawaii.

Mr. Dowsett asked if there was any clause in the ordinance which prevented the sale of milk from reactors, if the milk is first pasteurized or sterilized.

Attorney General Lindsay submitted the Dairy Ordinance and stated that milk, being a food product, the Board of Health has the right to issue orders regarding the sale of it, and it is the duty of the Board of Agriculture and Forestry to see that all herds in the Territory are free from disease, that all diseased animals be destroyed and to prevent the spread of infection; that four months after license is secured a certificate of inspection must be produced by the owners of cattle showing that they are clean, free from tuberculosis or any other communicable disease.

Mr. Waterhouse asked Dr. Glaisyer what provision was made in the State of Utah, where he has been testing cattle for the State authorities, for the identification of animals that were tested and passed and those that reacted.

Dr. Glaisyer replied that brass tags were used for identification of the reacting animals and aluminum tags for those that passed the test; these were numbered consecutively and a description of each cow was taken in case she should lose that tag.

After further discussion it was moved and seconded that Dr. Nörgaard be instructed to cable and arrange for the purchase of aluminum ear tags and everything necessary for their attachment and to design and have made official branding irons with which to mark the diseased animals. Carried.

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A meeting of the Board of Commissioners of Agriculture and Forestry was held in the Board room, at the Capitol, on Thursday, June 23, 1910, at 9 a. m.

*Present*—Marston Campbell, president and executive officer; Messrs. J. M. Dowsett and Albert Waterhouse, members, and Superintendent of Forestry R. S. Hosmer.

FORESTRY.

Mr. Campbell reported that he had seen Mr. Davies and had learned that the representatives of the Woods Estate are satisfied to accept the offer of $7.50 per acre which was made them for the forested portion of Kehena II.

In the matter of straightening the line of the Kohala Forest reserve above Waimea village, through a land exchange, Mr. A. W. Carter had not wanted to make the proposition as he was a member of the Land Board.

Mr. Campbell said that as nothing of this sort originates with the Land Board, there was no objection to the Board's acting on such a proposition. The matter will therefore be brought up to the Board by the Superintendent of Public Works.

Mr. Hosmer said that he had arranged to go over to Waimea on July 12, when he will take up matters in connection with this proposed exchange on the ground. The main object of the trip is the preparation of a planting plan for the area above Waimea village for which an allotment has already been made.

FENCING ON PIHA.

Mr. Campbell then read a letter from Mr. Hosmer under date of June 21, regarding a proposition from T. H. Davies & Company in which the Laupahoehoe Sugar Company requested coöperation of the government in certain forest fencing in the Hilo forest reserve.

Mr. Dowsett asked if the area in question near Laupahoehoe is government land and where the forest reserve line runs.

Mr. Hosmer answered that the Hilo forest reserve was one of the earlier ones to be set apart but that, in the absence of any one who could efficiently look after it, trespass from cattle had been continually going on. For a large part of the way the mauka boundary of the Hilo forest reserve follows the fence built by Mr. W. H. Shipman, across government and private lands. Mr. Shipman has been killing off the wild cattle below the fence, but at the west end of the reserve, above Laupahoehoe, the cattle nominally belonging to Mr. Meyers have had free run. The object of the present proposition is to restrict the cattle above Laupahoehoe to a relatively small fenced enclosure instead of letting them run throughout the entire forest.

Mr. Campbell said that Mr. Davies' proposition is made in entirely good faith. The condition as it exists today is that the government cannot keep Mr. Meyers off these lands, because there is no forest fence and no forest rangers. The plantation offers to corral the cattle and requests the government to assist in building the necessary fence. Mr. Campbell thought that the Board might well spend a few hundred dollars in building this fence.

Mr. Dowsett asked if the portion of the land of Maulua included in the forest reserve had not been condemned and the right of ownership given over to the government?

Mr. Hosmer said that nothing of that kind had been done and that, as a matter of fact, the action now proposed to be taken would do more for the protection of the forest than the government had been able or could now do unaided.

After further discussion in which it appeared to be the sense of the members that, if possible, the private land in this reserve ought to be turned over to the Board, it was voted that the matter be referred back to the Superintendent of Forestry for further conference with Davies & Company, pending action on their part of turning over to the Board the management of the land of Maulua, in which case the Board of Agriculture and Forestry will construct the necessary fence.

### GATHERING OF AWA.

In the matter of granting rights to gather awa in one of the forest reserves on Maui, for which application had been made by a Hawaiian, a letter from Mr. Hosmer covering one from Mr. W. F. Pogue was read by Mr. Campbell, in which Mr. Hosmer recommended that free use permits be granted freely to individuals when the article to be obtained is to be used by that person, but that when the product is to be sold the Board should exact a fair price. It was voted that a general rule be adopted that awa and other forest products may be taken from the forest

in accordance with the long standing custom of the country, which is in part confirmed by a statutory amendment, but that when awa is taken it shall be required that two dozen slips are to be set out for each mature plant removed. It was further voted that no other rights than those to be obtained under such a permit be given to the applicant from Maui, Mr. J. K. Kapunihana.

UNRESERVED LANDS IN FOREST RESERVES.

Mr. Campbell read a report by the Superintendent of Forestry under date of June 22, relative to the deferred setting apart of certain forest lands in the Hilo, Kau and Hamakua-Pali forest reserves on Hawaii and the Ewa forest reserves on Oahu. These are lands which are included within these reserves, but, owing to the wording of the original forest law, have not been technically set apart. After discussion it was suggested that formal action be taken now by the Board and that the Governor be requested to issue the necessary proclamation. It was therefore voted that the Superintendent of Forestry be instructed to prepare the necessary papers to bring this matter to completion.

RESERVATION OF KAHOOLAWE.

The Superintendent of Forestry requested that the Board accept, as having been read by title, at this meeting, a report recommending the setting apart of the island of Kahoolawe as a forest reserve. This island is now under a lease which terminates in eighteen months. In its present condition it is an extreme example of soil waste through mismanagement. The island can only be reclaimed by being systematically cared for. The most effective way of reclaiming Kahoolawe is to turn it over to this Board as a forest reserve. This proposition is brought forward now at the suggestion and request of the Governor. Furthermore, as a secondary consideration, the reclothing of Kahoolawe with vegetation ought to throw some light on the interesting problem of the effect of a cover of vegetation in influencing rainfall.

Considerable general discussion followed in regard to Kahoolawe, after which it was moved that the matter be referred to the Committee on Forestry, which body is to report back to the Board at an early date.

PRINTING OF EUCALYPTS REPORT.

It was moved and seconded that the Superintendent of Forestry use every endeavor to have Louis Margolin's report on Hawaiian Eucalypts printed by the U. S. Department, and President Campbell requested that all correspondence in connection with this matter be referred to him as he intended taking this matter up with the Bureau in Washington.

ROUTINE REPORTS.

The regular monthly report of the Superintendent of Forestry and that of the Superintendent of Entomology were accepted.

On account of illness and pressure of work the Territorial Veterinarian was excused from making a regular report of the work of his division until next meeting of the Board.

RARE ISLAND BIRDS.

It was voted that the application of Miss Annie M. Alexander for a permit to collect twenty specimens of each rare species of Hawaiian Island birds be rejected in consideration of the fact that there are so very few of the birds remaining and the Museum here has specimens of all the birds for the purpose of scientific study. The secretary of the Board was instructed to write Miss Alexander, informing her to that effect.

ANIMAL INDUSTRY.

The President read a letter to C. Brewer & Company under date of May 21, from the Hutchinson Sugar Plantation Company at Naalehu, Kau, in regard to the withdrawal of the quarterly payments—their contribution—on account of the salary of Veterinary Surgeon Elliot; also letter from C. Brewer & Company of May 26, to the President of the Board under date of June 8, in regard to the same.

President Campbell had to report to the Board that these payments on account of salary will, however, continue.

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## DIVISION OF FORESTRY.

Board of Agriculture and Forestry, Honolulu, Hawaii.

Gentlemen:—I have the honor to submit the following report of the work of the Division of Forestry for the past month:

PLANTING PLAN FOR MOLOKAI RANCH.

Based on the study made on the ground during a trip to Molokai in May, I personally have spent some time this month in preparing a comprehensive report outlining a general scheme for forest planting on the lands owned by the Molokai Ranch Company. This work was done at the request of the Ranch Company under the standing offer of assistance to tree planters made by the Division of Forestry. It is expected that the Ranch Company will begin actual work in tree planting next winter.

DISTRIBUTION OF TREES.

Owing to a setback in the growth of the seedlings, due to a spell of wet weather some weeks ago, the shipment of trees for the planting of Water Reserve C, at Pupukea, has been temporarily discontinued. Some 10,000 trees are being got ready for this place, however, and will be sent down at the end of this month. During May and the first part of June several shipments of seedlings were made from the Government Nursery to various persons and corporations; in all about 27,000 trees have been sent out since May 1, 1910. Mr. Haughs' reports give the details of this matter.

In this connection I would call attention to the fact that delay can be avoided in obtaining trees from the Government Nursery if persons or corporations desiring to obtain seedlings will submit a memorandum of what they want a few months prior to the date the trees are desired. As seedlings in the nursery keep on growing and soon get to a size too large to be successfully handled, it is impracticable to keep large numbers constantly on hand. It takes from two to four months to grow most of the Eucalypts from seed to a size suitable for planting. The Division of Forestry is delighted to grow all that are wanted, but the members of the staff would decidedly appreciate having advance notice of probable demands.

A NEW FOREST RESERVE.

Following a public hearing on June 13, Acting Governor Mott-Smith on the same day signed a proclamation creating a small forest reserve in the District of Hamakua, Island of Hawaii, a portion of the government land of Hauola, some seven acres on the edge of the bluff above the sea. The object of this little reserve, which is called the Hauola Forest Reserve, is to make possible better care than could otherwise be given to a shelter belt of Ironwood trees that protects the good agricultural land behind.

During the past month considerable progress has been made on several other forest reserve projects. These will be brought before the Board at an early date.

FOREST FENCE AT PUPUKEA.

One of the forest fences at Pupukea—that on the Waimea boundary—has now been completed and the other is in process of construction. During the month I have made two inspection trips to Pupukea in connection with this work.

BOTANICAL EXPLORATION.

Since May 13, Mr. J. F. Rock, the Botanist of the Division of Forestry, has been in the Kohala District on the Island of Hawaii, collecting herbarium material in the native forest, weeds and other plants on the ranches, and gathering data in general in regard to plants now growing on the Islands. On the slopes of Mauna Kea, along the ditches on the windward side of the Kohala Mountain, and in the paddocks of the Parker Ranch he has got many valuable specimens. Mr. Rock expects to return to Honolulu at the end of June.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

June 20, 1910.

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## DIVISION OF ENTOMOLOGY.

Honorable Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit my report of the work of the Division of Entomology for the month of June.

Of 32 vessels boarded we found fruit, plants and vegetables on 19. The usual care was taken in the rigid inspection and the following disposal made:

| *Disposal with principal causes.* | *Lots.* | *Parcels.* |
|---|---|---|
| Passed as free from pests | 915 | 14,328 |
| Fumigated before releasing | 8 | 16 |
| Burned | 11 | 11 |
| Total inspected | 934 | 14,355 |

PESTS INTERCEPTED.

In a small lot of ferns from New Zealand we found quite a number of caterpillars among the moss packing belonging to the Tinedas, the ferns were not eaten by the pest and we believe that the caterpillars were feeding on the moss and refuse of the shipment. A strong fumigation was given and all packing material carefully removed and destroyed.

Several lots of small palms from the Eastern States slightly infested with Scale insects (Aspidiotus cyanophylli) arrived by mail and were first fumigated before releasing.

In the baggage of the Chinese immigrants some sweet potatoes infested with the sweet potato borer, Cylas formicarius, were found and were destroyed. This pest is already well established in the Islands, but one never knows where the baggage is going and it is best to prevent the dissemination of the pest into new sections.

At the port of Hilo the following report of inspection was received:

Seven vessels were boarded and the total of 105 lots containing 1,080 parcels were examined. Nothing containing insect pests or fungi was found. In the future the inspector will give a more itemized account of the work, as it is most important to know just what fruits and vegetables are being shipped into the country. During the month Brother Newell paid the Division a visit and I had an opportunity to go over the work with him; he is very desirous of having me visit his district soon and I hope that I can manage to do so.

During the month Mr. George Compere, who has been collecting beneficial insects in the Philippines, passed through Honolulu on his way to California. I am pleased to state that I was able to give Mr. Compere some assistance in collecting food, mostly Mealy bugs and Cottony Cushion Scale as food for the various ladybirds he is taking to the Coast. Mr. Compere mentioned the existence of a parasite for the Alligator Pear scale, Pseudococcus nipae, at Manila and I shall communicate with the Department of Agriculture there and see to what extent the pest is kept in check and if arrangements can be made to procure the same.

Two sendings of parasites, Pimpla behrensii, have been received from Mr. J. P. Baumberger, who is collecting for our Division under my directions in California. We are in hopes that these parasites will help reduce the ravages of the Cocoanut leaf folder, Omiodes blackburni and other caterpillars infesting some of the truck crops of the Islands. The one species of Pimpla we have in the Islands is doing excellent work in the reduction of caterpillars and more species will naturally greatly add to the efficiency of the work of those already with us.

### BENEFICIAL INSECTS DISTRIBUTED.

Captain Piltz of the "Florence Ward" called upon me during the month and stated that he feared the Hornfly Haematobia serrata was at Midway Island and wanted some parasites for the same. After making many inquiries about the flies observed by him and after consulting with Mr. B. W. Colley, the local agent, we are doubtful whether the Hornfly exist there. We, however, have been able to send parasites of the Stable fly, Stomoxys calcitrans, and the House fly, Musca Domestica, and have asked the agent to collect specimens of the various flies for our examination so that we shall definitely know what flies really exist on Midway

Island. Mr. F. W. Terry of the Hawaiian Sugar Planters' Association kindly coöperated with our Division in this matter and we shall continue our investigations until we can be assured that the flies are being reduced by the parasite, Eucoila impatiens.

During the month the following parasites and predaceous insects were liberated:

5 colouies of Pimpla behrensii,
7 colonies of Novius cardinalis,
1 colony of Cryptolaemus montrouzieri,
1 colony of Sculellista cyanea,
1 colony of Eucoila impatiens for Midway.

By consent of the President of the Board, your Superintendent has been able to procure the services of Mr. D. H. Marsh as Assistant Entomologist. The position of Inspector's Assistant will be vacant after August 1st, at which time Mr. Marsh will start upon his work.

Very truly yours,

EDW. M. EHRHORN,
Superintendent of Entomology.

Honolulu, July 1, 1910.

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## *INOCULATION AGAINST HUNGER.*

The new science of fertilizing ground for the farmer is described in the issue of *Harper's Weekly* for July 16th by Katharine Newbold Birdsall. How can the nitrogen in the air be brought down and made to enrich the soil? Certain plants, she says, have the property of absorbing this nitrogen, through the medium of millions of bacteria which gather the free nitrogen from the air. These are the clovers, pease, beans, peanuts, alfalfa, etc. The nodules which are formed on their roots by the bacteria contain millions of these beneficent germs, which can be cultivated in jelly, and distributed among farmers to be poured over seeds before planting at a cost of less than two dollars an acre.

# REPORT ON RICE AND COTTON INVESTIGATIONS IN CHINA AND JAPAN.

By F. G. Krauss.

(Continued from June issue.)

## III. Fertilization Experiments.

Special inquiry was made as to the investigations on the fertilization of rice. The principal work along this line has been done at the Central Experiment Station at Nishigahara, and at the Imperial Agricultural College near Tokyo. I spent several days at the former institution, to familiarize myself as much as possible with their work and methods. The results obtained by them have largely been published, and as I was able to obtain most of the publications, the work is only briefly touched upon here, and a fairly complete bibliography of the published data is added to the end of this paper.

Probably no other line of research has been so fully developed in the colleges of agriculture and experiment stations of Japan as that of agricultural chemistry. The work follows the German school closely, and the influence of the teachings and work of Kellner, Loew and other German investigators in Japan is very evident in all their methods. The fact that more than half their work, published in foreign languages, appears in German gives further evidence of German influence. Many of the Japanese investigators have studied in Germany. Their references are largely to German works, and they speak that language more fluently than they do English.

Much of their fertilization experiments are made with pot cultures, after the Wagner method. So efficient did this method appear to the writer, that a careful study was made of it with the idea of introducing it in our own work. The officials of the Central Experiment Station presented a sample pot of the most approved form and on consultation with the Station chemist, it was decided to secure fifty pots from Japan. Thirty of these pots were received in time for our spring experiments and are now in use.

The following description of the pot (and accompanying photograph) may be helpful to others desiring to adopt this culture method. The pot is of high grade porcelain, glazed inside and outside. It is ten inches in diameter and twelve inches in height, inside measurement. A hole for drainage and separate hole for sub-irrigation are provided at the bottom. These openings are protected by porcelain guards, and the space in front and to an inch above, are filled with coarse gravel, coated with half an inch of clean quartz sand, to prevent the soil from filtering through.

Ten to twelve kilos of soil, representing approximately one fifty-thousandth acre foot, are used as the area unit, as this is approximately the area allotted to a clump of rice under field conditions. The soil is treated before it is put in the pot, the optimum moisture is supplied, and the rice seedlings are transplanted at the proper time. If it is intended to weigh the pots during the growth of the plant, the weight of all the pots is first made uniform by means of the gravel in the bottom. All experiments are carried on in triplicate, and the uniformity of growth observed by the writer in hundreds of such cultures would indicate that the average is affected only infinitesimally by individual discrepancies. The cultures are grown in the open and under glass, and the results obtained seem to be very satisfactory. A galvanized iron pot of the same dimensions as the porcelain one is also used and some of these have been in service for ten years. They are, however, not considered sufficiently reliable where acids constitute part of the fertilizer.

In addition to the above method, cultures are maintained in the field, in metal and earthen-ware cylinders which are sunk into the rice paddies. These cylinders are three feet in diameter and three feet in depth. Four inches are left projecting above the ground, and at a level with the ground surface there are several inch-wide holes to admit irrigation water when the paddy field is flooded. Five clumps of rice are transplanted to each of these cylinders. This method also gives very satisfactory results. An earlier, and somewhat cruder, method of growing cultures in the field was to sink a wooden frame three feet square into the paddy field, in which nine clumps of rice were planted. Better control and economy of space are the advantages claimed for this type of field cultures.

The accompanying photographs give some idea of the arrangement and extent of these cultures. Field plot experiments with fertilizers are maintained only for demonstration purposes, when the plots cover several square rods.

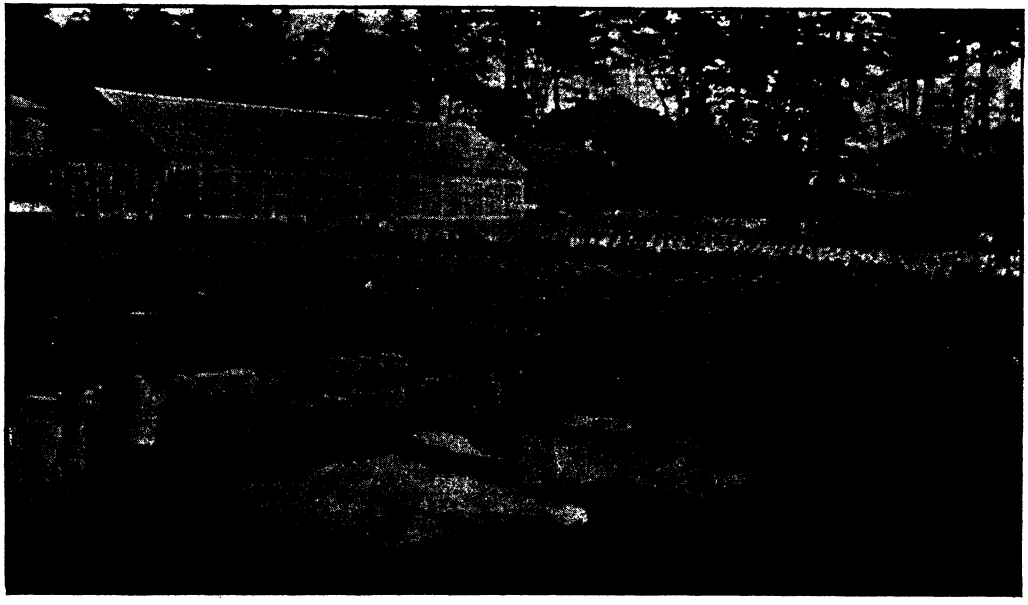
The adoption of pot and cylinder cultures in our work is strongly recommended for their accuracy and ease of use in carrying on a large number of experiments.

Beginning in 1889, Kellner and his associates conducted a series of experiments to determine the exhaustion of the nutrient material in the soil by successive croppings, and the amount of artificial fertilization necessary to maintain fertility. These experiments extended over a period of six years. A detailed report of them will be found in Bulletins of the College of Agriculture, Vol. I, 8-11, and Vol. III, pp. 371-406. All of these bulletins are now out of print, except Bulletin 11, which summarizes the first three years' work.

Taking the average of the results of a great many analyses, it was found that an ordinary crop, yielding 2,500 pounds of rice, removes from an acre of soil about 26 pounds of nitrogen, 16

OUT-DOOR PLANT FOR POT AND SUNKEN CYLINDER CULTURES, IMPERIAL CENTRAL AGRICULTURAL EXPERIMENT STATION, NISHIGAHARA, TOKYO, JAPAN.

In foreground, sunken galvanized iron cylinders, used for fertilizer experiments with upland-cultures. Similar cylinders made of terra-cotta are sunken in paddy-fields for experiments with wet-land rice.



General view of pot and sunken cylinder cultures, together with glass house for indoor pot cultures. Several thousand such cultures are under way at this Station alone.

pounds of phosphoric acid and 28 pounds of potash. A good crop, yielding 4,000 pounds of grain, removes about 40 pounds of nitrogen, 25 pounds of phosphoric acid and 40 pounds of potash. The proportion removed by the grain and the straw respectively are also given. In these experiments the three essential elements were applied to the soil at the rate of about 90 pounds of each to the acre. The nitrogen was applied as ammonium sulphate, the phosphoric acid as double superphosphates, and the potash as potassium carbonate. The plants receiving the complete fertilizer yielded best; the next best yield came from the plants to which no potash was supplied; and the next best, from those to which no nitrogen was supplied. The poorest yields came from those which had no phosphoric acid. This indicated that the soils under consideration lacked phosphoric acid most, nitrogen to a less degree, and potash least of all. It also indicated that for the production of every 100 kilos of rice paddy

CULTURAL POTS USED BY THE JAPANESE AGRICULTURAL EXPERIMENT STATION.

Figs. 1 2 3 4 5 6 7

Fig. 1. Glass cylinder about 4″x8″ in size, used for sand cultures.
2. Glass cylinder about 3″x8″ in size, used for water cultures.
3. Wire basket pots (after Whitney) about 4″x4″, used for transparation method of determining growth.
4. Porcelain beakers, about 5″x6″, used for growing single seedlings to maturity, but considered too small for best results.
5. Improvised earthware cultural pot, considered too shallow for best results, about 14″x9″ in size.
6. One of the earlier type of "Wagner" porcelain culture pots, 10″x12″ in size.
7. Heavy galvanized iron culture pot of approved design, but not suited for use with fertilizers containing acid constituents.

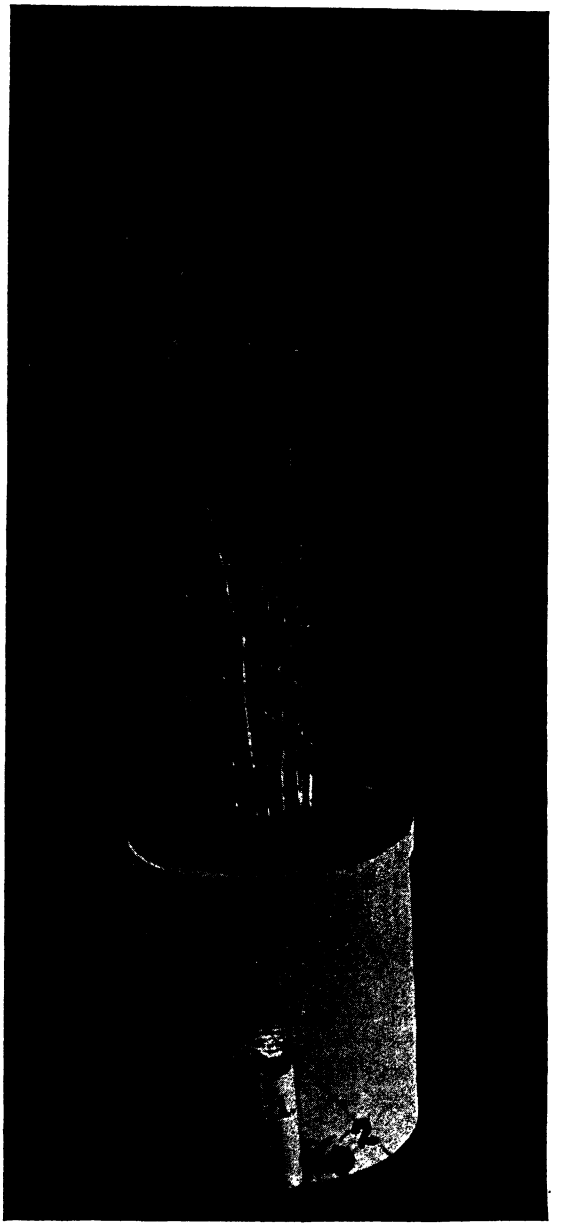


FIG. 8.

Fig. 8. Most approved "Wagner" culture-pot. It is made of high-grade porcelain, glazed inside and out. Diameter 10″, depth 12″, inside measurement. It is provided with an "in-take" (1), and a drainage outlet (2).

2.53 kilos of ammoniacal nitrogen, 1.42 kilos of phosphoric acid, and 1.31 kilos of assimilable potash is necessary, assuming that at the beginning these constituents of the soil are entirely lacking.

The assimilation factor of ammonium sulphate was found to be, for nitrogen, 62%; of superphosphates, for phosphoric acid, 24%; and of potassium carbonate, for potash, 50%.

As in the stations investigations, nitrogen appeared to be the controlling factor in rice fertilization, it would be pertinent here to offer reasons for the results obtained in Japan. The important role of the nitrogenous manures in soil fertilization has long been recognized in Japan, and perhaps nowhere else are nitrogencus fertilizers used to such an extent as there. Heavy green-manuring and composting are the universal practice, and owing to it, rather than to the natural supply of nitrogen in the soil, (which otherwise must long ago have become exhausted) are due the results which have been mentioned.

The important point for us is this: After centuries of heavy cropping the paddy fields of Japan have each year become more fertile, especially so in the most essential and expensive nutrient material, nitrogen. Hawaiian rice lands, on the other hand, are becoming more and more impoverished each year, lacking particularly nitrogen. The writer believes that the only rational remedy is the adoption of the Japanese practice of adding humus and other nitrogenous matter to the soil in the form of green-manures, composts and other organic fertilizers, with crop rotation and the emergence of the soil for at least half the year, during which time the substitute crop would preferably be of such a nature to require inter-tillage throughout its growing season. Reference will be made later to rotation crops in Japan and their management.

While we have demonstrated the stimulating effects of ammonium sulphate it is questionable whether increased yields can be obtained continuously from this source alone. The Japanese investigators, with whom I conversed on the subject, seemed to doubt it. While as a matter of fact, they demonstrated early the greater efficiency of ammonium sulphate, as compared with sodium nitrate, calcium cyanide and other concentrated nitrogenous fertilizers, it has been found that an extensive and continuous use of these fertilizers results in an altered physical condition of the soil, which may be followed by serious deterioration of its mechanical and chemical construction. As we have repeatedly proved that sulphate of ammonia is more available than nitrate of soda in rice fertilization, the question arose as to the form in which nitrogen is assimilated by the rice plant in submerged cultures. Drs. Daikuhara and Imaseki, of the Central Experiment Station, who have been closely connected with the Japanese investigations, are thoroughly satisfied that the rice plant freely assimilates its nitrogen as ammonia. This was proved by the fact that the plants thrive in the presence of am-

monium nitrogen and the total absence of nitrate nitrogen. They seem to have proved that ammonium nitrogen and organic nitrogen cannot be converted into the nitrate form in submerged cultures; and further have they shown the general instability of nitrates in the submerged soil, due to reversion and loss by leaching, so that very little is available for plant nutrition in this supposedly essential form. It has also been found that more of the poisonous nitrites are formed in submerged lands than in dry lands. In a recent bulletin "On the Behavior of Nitrate in Paddy Soils," Buls. Imp. Cen. Exp. Sta., Vol. I, No. 2, the conclusions of the two investiagtors above mentioned are summarized as follows:

"(1) When nitrate is applied to the paddy soil it is reduced to some extent, first to nitrite, and then to ammonia and to elementary N, the loss of which varies according to the species of denitrifying organisms and the amount of soluble organic compounds present originally in the soil.

"(2) When nitrate is applied to the paddy soil, together with much organic matter in easily available form for microbes, such as glycerine, Na-acetate, starch, fresh oil cakes and straw, it is destroyed extensively by denitrification, the most part of its nitrogen being lost as free N, while only a certain portion of it remains in the soil, being partly assimilated by microbes and partly absorbed as ammonia by the soil or plants.

"(3) The question why nitrate is not a favorable manure for plants grown in paddy land can be answered as follows:

(a) *The loss of N by denitrification* is larger in paddy soil than in dry land.

(b) More of the *poisonous nitrites* are formed there than in dry land.[1]

(c) *Loss of nitrate* takes place easily by the system of *irrigation*, practiced with paddy plants, being inevitable in the farmers' practice.

"(4) Dry land surface soil, when no organic manures are applied along with nitrate, does not favor denitrification nor nitrite-formation, while in the subsoil, reduction occurs to some extent. In very moist conditions, however, as in the rainy season, and especially when much organic manure is applied along with nitrate,[2] some denitrification takes place even in top-soil, and the reduction can proceed so energetically in the sub-soil that all the nitrate applied may be reduced within a few weeks.

"(5) Organic matters easily available to microbes favor denitrification to a large extent; further, straw or fresh rape cake

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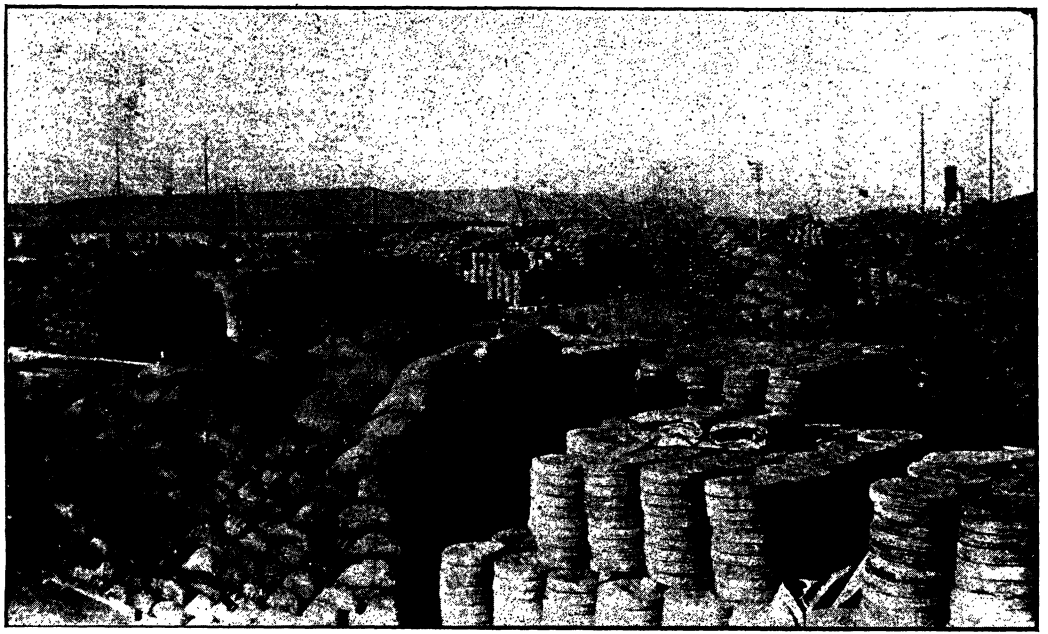
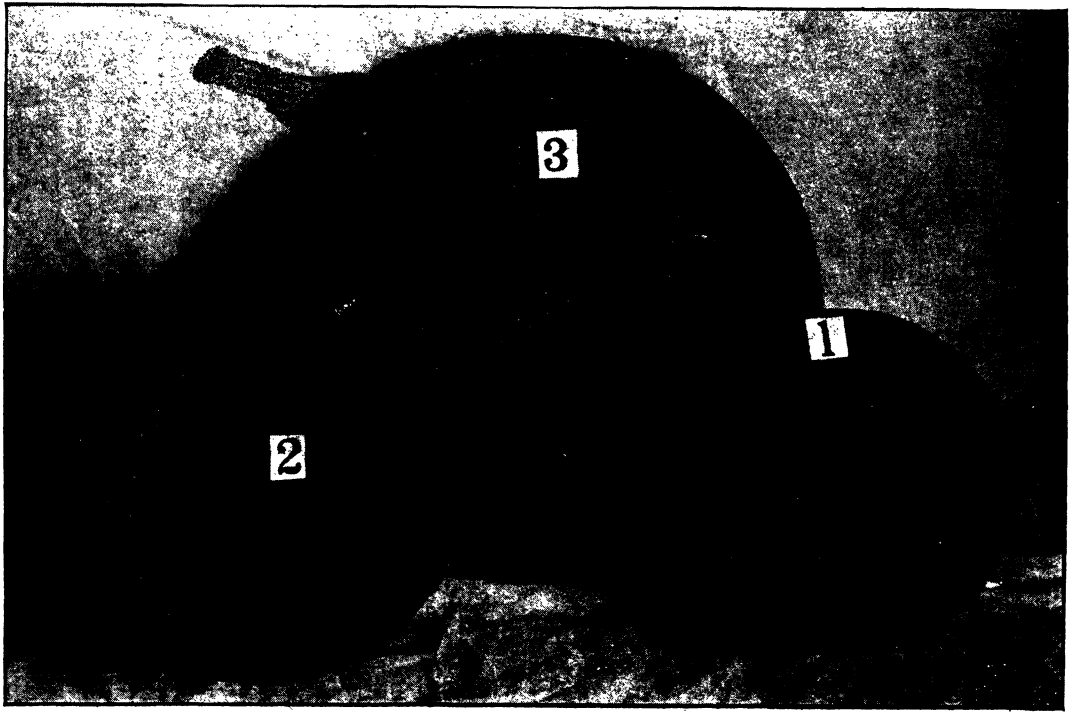
[1] Young rice plants placed in a potassium nitrite solution of 0.1% died after five days.

[2] According to Ampola, calcium nitrate is less attacked by denitrifying microbes than sodium or potassium nitrate, but in most soils calcium nitrate added will surely be changed by alkali-salts, and nitrates of sodium or potassium be formed.

OIL SEED CAKES EXTENSIVELY USED AS FERTILIZERS IN JAPANESE AGRICULTURE, ESPECIALLY IN RICE CULTURE.



Soy beans and soy bean sakes, the latter used as fertilizer and for stock feeding. While extensively grown in Japan, the bulk is imported from Manchuria.




Oil seed cakes used as fertilizers. They must contain the manufacturer's brand and are under government inspection.

1. Cotton seed cake, guaranteed analysis.—Total N. 6.0%; Total $P_2O_5$ 2.0%
2. Rape seed cake, guaranteed analysis.—Total N. 5 35%; Total $P_2O_5$ 2 5%
3. Soy bean seed cake, guaranteed analysis.—Total N. 6.50%; Total $P_2O_5$ 1.5%

(Samples at the Hawaii Station.)

have more influence upon the reduction of nitrate than the same materials well rotted, which agrees with former observations on stable manure."

While ammonium sulphate has usually been found to be very effective as a source of nitrogen in submerged rice culture, in acid soils it exerts a detrimental influence. The same has been found true of organic forms of nitrogen, especially those of a vegetable origin, as rape seed and soy bean cakes; those of animal origin, as dried blood, tankage, fish guanos, etc., much less so. When, however, such soils (which form fully 90% of Japan's paddy fields), are neutralized by liming, these fertilizers again exert their maximum power.

At the time of the visit to the Kyushu Station a series of pot and plot fertilization experiments were under way, which strikingly demonstrated these points. The soil under consideration was an acid granite soil, which, untreated, gave a poor yield. When treated with just enough lime to bring about a neutral condition, a fair crop was produced. When a complete manure was added in addition to the lime, whose constituents were all acid, i. e., a formula consisting of 5% nitrogen as sulphate of ammonia, 5% phosphoric acid as acid phosphate, and 5% potash as sulphate of potash, the yields were materially increased. But when the same fertilizer was applied to the unlimed soil a detrimental effect was noticeable. The same held true of sulphate of ammonia or organic materials of a vegetable origin used alone. When a complete fertilizer was made up of non-acid constituents, beneficial results were obtained, even when the soil had not previously been neutralized by liming.

From these and many other experiments, it has been concluded: 1. That many soils of reasonable fertility fail simply because of excessive acidity, and that this condition may be corrected by moderate liming. 2. Acid soils, instead of being benefited by fertilizers that are acid, are made worse. Fertilizers, rich in organic materials of animal origin, may prove beneficial on acid soils without liming, but liming greatly enhances their value. 3. Organic fertilizers of a vegetable origin are less suited to acid soils than are organic materials of animal origin.

It is interesting to note that the liming of paddy soils has been placed under government supervision in Kyushu because it was found that the indiscriminate use of lime tended to destroy the soil humus, and in other ways proved detrimental.

As much of the research in the chemical division is of a highly technical character, reference is made to the published data given in the bibliography.

(To be continued.)

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Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.
Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.
Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.
Fourth Report of the Board of Commissioners of Agriculture and Forestry, for the calendar year ending December 31, 1907; 202 pp.; 7 plates.
Fifth Report of the Board of Commissioners of Agriculture and Forestry, for the calendar year ending December 31, 1908; 218 pp.; 34 plates.
"Notice to Importers," by H. E. Cooper; 4 pp.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.
"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.
"Law and Regulations, Importation and Inspection of Honey Bees and Honey." General Circular No. 3; 7 pp.; 1908.
"The Hawaiian Forester and Agriculturist," a monthly magazine. Vols. I to VI; 1904-1909. To be obtained from the Hawaiian Gazette Co., Honolulu. Price $1 a year.

### DIVISION ON ENTOMOLOGY.

"The Leaf-Hopper of the Sugar Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.
** "A Catalogue of the Hemipterous Family Aleyrodidae," by G. W. Kirkaldy, and "Aleyrodidae of Hawaii and Fiji with Descriptions of New Species," by Jacob Kotinsky. Bulletin No. 2; 102 pp.; 1 plate; 1907.
* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.
"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.
"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.
Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.
Report of the Division of Entomology, for the year ending December 31, 1906. Reprint from Third Report of the Board; 25 pp.; 7 text figures.
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Report of the Division of Entomology, for the year ending December 31, 1908. Reprint from Fifth Report of the Board; 26 pp.; 2 plates.

### DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.
* "Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.
"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.
"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.
* "Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.
"Instructions for Planting Forest, Shade and Ornamental Trees." Press Bulletin No. 5; 7 pp.; 1909.
"Na Hoakaka no ke Kanu Ana i na Laau Malumalu ame na Laau Hoohiwahiwa." Press Bulletin No. 6; 8 pp.; 1909.
Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.
* Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.
Report of the Division of Forestry, for the year ending December 31, 1907. Reprint from Fourth Report of the Board; 70 pp.
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# Board of Agriculture and Forestry.

## PUBLICATIONS FOR DISTRIBUTION—Continued.

### DIVISION OF ANIMAL INDUSTRY.

* "Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.
* "Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.
"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.
* "To Amend Rule 1, Inspection of Imported Live Stock." Rule 4; 1 p.; 1907.
"Rules and Regulations, Inspection and Testing of Live Stock." Rules and Laws; 11 pp.; Revised; 1910.
"Quarantine of Horse Stock from California." Rule 8; 1 p.; 1908.
Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.
Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.
Report of the Division of Animal Industry, for the year ending December 31, 1907. Reprint from the Fourth Report of the Board; 104 pp.; 6 plates.
Report of the Division of Animal Industry, for the year ending December 31, 1908. Reprint from Fifth Report of the Board; 44 pp.

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## DIVISION OF FORESTRY.

### FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

## DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief we like and sometimes it is indispensable for us to see the insect suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed at 3rd class rates. When specimens are not accompanied by letter *always* write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 331, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

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